REMARKS

Our present invention not only enables a cost reduction in an optical transmitter and optical receiver with one optical fiber, it further provides a high quality output electrical signal.

The present invention is characterized by an optical receiver that includes "a first processing unit operable to receive an optical signal, intensity-modulate the received optical signal, and split the intensity-modulated optical signal into two optical signals of which respective intensity-modulated components are in antiphase," "first and second optical transmission lines which transmit the two optical signals respectively" and "a second processing unit operable to convert the two optical signals into electrical signals respectively, and generate an output electrical signal by performing differential amplification on the electrical signals."

This structure enables the optical receiver in the optical transmission system of the present invention pertaining to the amended Claim 1 to generate a high-quality output electrical signal. The reason is as follows.

The first processing unit generates two optical signals whose intensity-modulated components are in antiphase. The two generated optical signals, whose intensity-modulated components are in antiphase, are transmitted to the second processing unit through the first and second optical transmission lines. Further, the second processing unit converts the two optical signals into electrical signals respectively, and performs differential amplification on the electrical signals.

With these operations, the output electrical signal is generated such that the intensity-modulated components of the electrical signals, which have been converted from the two optical signals whose intensity-modulated components are in antiphase, are in phase. Meanwhile, the in-phase noise components of the two optical signals are amplified so as to be in

antiphase by the differential amplification, and accordingly, the noise components are cancelled out. That is, the generated output electrical signal does not include the noise components included in the optical signals. Therefore, it is possible to obtain a high-quality output electrical signal.

The Office Action rejected Claims 1-4 and 13-16 as being obvious over a combination of *Chew et al.* (U.S. Patent No. 7,260,330) in view of either *Trinh* (U.S. Patent No. 6,822,743) or *Kersey et al.* (U.S. Patent No. 5,410,404.

Claims 6-7 and 18-19 were further rejected over *Chew et al., Trinh, Kelsey et al.* and *Pua et al.* (U.S. Patent No. 6,647,176). *Pua et al.* was only cited for a polarization scrambler.

The *Chew et al.* reference discloses a correlation receiver that can avoid the use of custom optical filters thereby providing a lower cost. *Chew et al.* teaches a transmission medium 117 which may be a length of fiber, a transmitting and receiving telescope, a satellite communication system or any other fiber communication means known within the art. See Column 7, Lines 10-13. Basically, *Chew et al.* does not address any issue of a use of an optical fiber between the transmitter and the receiver.

The *Trinh* and *Kersey et al.* references were basically cited to modify the *Chew et al.* reference, to disclosed first and second optical transmission lines for connecting two optical signals to dual detectors in the optical receiver, and more particularly for using a pair of optical fibers in Figure 7 of *Trinh* for connecting the photo detectors 715 and 716 and a pair of optical fibers in the *Kersey et al.* reference in Figure 1 for connecting the respective couplers 22 and 24 to the photo detectors 72 and 74.

Since the *Chew et al.* was the principal teaching reference, applicant has reviewed it in an effort to determine whether it would be possible to perform the same function as defined in our

presently amended claims and to produce a corresponding high quality output electrical signal in the same manner in which we had achieved this goal.

As noted in the MPEP at §2143.02:

> A rationale to support a conclusion that a claim would have been obvious is that all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded nothing more than predictable results to one of ordinary skill in the art. *KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, ___, 82 USPQ2d 1385, 1395 (2007); *Sakraida v. AG Pro, Inc.*, 425 U.S. 273, 282, 189 USPQ 449, 453 (1976); *Anderson's-Black Rock, Inc. v. Pavement Salvage Co.*, 396 U.S. 57, 62-63, 163 USPQ 673, 675 (1969); *Great Atlantic & P. Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147, 152, 87 USPQ 303, 306 (1950). (underline added)

Chew et al. teaches the function of first, a correlation modulator 118 that receives a clock signal as a reference pulse and synchronizes digital signals to be optically transmitted and second, a 1-bit-time-delay interferometer 122 that splits the optical signal output from the correlation modulator 118 into two optical signals and causes a 1-bit time delay.

In particular, the *Chew et al.* reference recites specific operations of the 1-bit-time-delay interferometer 122. In the case of performing multiplexing after a 1-bit-delay, the interferometer 122 selects as an output destination, one of the two photo detectors (PDs) included in the dual photo detector 124 according to the bit characteristics. See Column 7, Lines 44-57 as follows:

> The interferometer 122 and dual photodetectors 124 may demodulate the filtered signal 121 to provide electrical signal 125. The interferometer 122 splits the signal into two paths, then recombines the signal from the two paths. One of the paths introduces a time delay compared to the other path; the time delay may be 1 bit period and such an interferometer would be called a 1-Bit-time-Delay interferometer. The interferometer causes the signal from one bit interval to combine with the signal from a delayed bit interval in such a way that if the signals from both bit intervals are of the same polarity, optical power is sent to one of the dual photodetectors 124 but not the other, but if the signals from the two bit intervals are of opposite polarity, optical power is sent to the other one of the dual photodetectors.

Since the interferometer 122 outputs a signal to either one of the two PDs included in the dual photo detector 124, it is impossible to convert two optical signals into electrical signals respectively and perform the differential amplification on the electrical signals. Thus, the dual photo detector 124 does not disclose or suggest a second processing unit as set forth in the present application.

On the other hand, since the optical receiver in the optical transmission system of the present invention includes a first processing unit as stated above, the optical receiver can generate the two optical signals whose intensity-modulated components are in anti-phase. The noise components are cancelled out because the demodulation is performed with use of the two optical signals whose intensity-modulated components are in anti-phase. Therefore, the present invention can achieve the advantageous effect, that is, it is possible to obtain a high-quality output electrical signal.

Trinh teaches the use of optical fibers 711 and 712 to be connected to the photo detectors 714 and 716. However, *Trinh* does not disclose or suggest the second processing unit of the present application.

Kersey et al. teaches the use of optical fibers 52 and 54 for connecting the couplers 22 and 24 to the photo detectors 72 and 74. *Kersey et al.* also does not disclose or suggest the second processing unit of the present application.

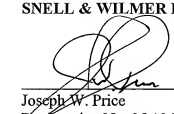
Pua et al. also does not teach the second processing unit of the present application.

In view of the above amendments to the claims and comments, it is believed that the present application is now in condition for allowance and an early notification of the same is requested.

If the Examiner believes that a telephone interview will help in the prosecution of this matter, the undersigned attorney can be contacted at the listed phone number.

Very truly yours,

SNELL & WILMER L.L.P.



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